A SURVEY OF THE PREDICTION OF GRADUATE STUDIES SUCCESS

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CHAPTER I

INTRODUCTION

Higher education is becoming more of a certainty to all students in the United States. Because of this demand for higher education, the graduate schools need to have a more precise method of predicting the success of those whom they admit. A number of devices have been used in selecting prospective graduate students; most entail some form of a general aptitude or achievement test. One of the most common tests used for graduate studies admission is the Verbal and Quantitative portions of the Graduate Record Examination. A number of studies have been constructed in attempts to validate the predictive ability of the Graduate Record Examination, they include studies carried out by Robertson and Nielson (1961), Borg (1963), and Madaus and Walsh (1965). All of the above found very little predictive validity between the Graduate Record Examination and the criterion measure which was either grade point average, faculty ratings of the students, or students' self-ratings. Other research carried out by Lannholm and Schrader (1951), King and Besco (1960), and Law (1960) has obtained a significant predictive relationship between the Graduate Record Examination subscales of Verbal and Quantitative with the same criterion measures as above, either grade point average, teacher ratings, or self-ratings.

The Graduate Record Examination is not the only test which has been used to predict success in graduate studies, other tests, including the

Miller Analogies Test, and the Comprehensive College Level Examination Program, have been used for prediction of success. These tests were again compared to criterion measures of grade point average, teacher ratings, or students' self-ratings. Eckhoff (1966) performed a stepwise multiple regression using undergraduate grades, Miller Analogies Tests, and the Advanced Education portion of the Graduate Record Examination. He found that the advanced portion of the Graduate Record Examination added little to the regression equation, leaving the Miller Analogies Test as the better predictor.

The major problem then is twofold, first in trying to establish one test or a group of tests which will have some stable predictive validity for graduate success. But before the establishment of one variable or a group of variables for predictive purposes can be totally accomplished, a criterion of comparison must be set which will be meaningful and accurate; this then is the second portion of the problem. Grade point average as a criterion is questionable in correlational studies since it usually consists of a very restricted range. Self-ratings are a questionable basis for predicting college success, since one's own feelings often have nothing to do with actual achievement in one's studies. Teacher or faculty ratings may be accurate but each rating scale must be considered in the light of both its validity and reliability. Perhaps the main consideration must be to develop a definition of success, thereby setting up a criterion measure. One possible definition of the criterion measure could be listing those who have completed a program as a successful group, and those who have not completed a degree as an unsuccessful group. The individual's scores on a number of tests or scales which have

established reliability and validity can then be used to identify the people who will fall into the two groups.

Statement of the Problem

The present study is concerned with the problem of predicting success in graduate studies. The major purpose of this study is to determine the possibility of identifying variables which may act as predictors of graduate success. The purpose of this study then is to attempt to identify the variables involved in the ability to predict success and to identify instruments which can measure the variables identified as playing a part in the prediction of academic success. A secondary purpose of this study is to attempt to identify as many as possible of the confounding variables which hinder the prediction of success, providing they exist in the population studied.

Theoretical Approach

The necessity of being able to predict is of great interest to many in both education and industry. And although a number of authors such as Stricker and Huber (1967), Alexakos (1968), and Ayers (1971) say tests may be able to predict, others say they have found that accurate prediction is not possible through testing. Hackman, Wiggins, and Bass (1970) and Ayers (1971) as well as other researchers have used past performance, such as high school grades and undergraduate college grades, to predict academic success in graduate school. These predictors have also lead to conflicting results. Future academic performance is able to be predicted by past performance in some studies, while other studies show no relationship between past and future performances.

Not only are there conflicting results shown in the research dealing with what is used to predict graduate success, but the criterion measure of success often differs from study to study. The criterion measure depends largely upon how the individual doing the research chooses to define success. Definitions have included considering a students' grade point average, teacher ratings other than grades, and students' self-ratings, but all of these criteria are questionable. If grade point average is to be used as the criterion measure, then the question which must be considered is the restricted range in grading at the graduate level, correlations will of necessity show relationships which may in actuality be non-existent. The other forms of criterion measures are, because of the lack of validation on the questionnaires and rating scales, not effective ways of showing relationships. The results of studies using teacher ratings or student self-ratings show no consistency of prediction due mainly to the fact that the measures have little or no validity or reliability. It may also be questionable as to whether the last two stated criteria are measures of success at all.

Using the previous research to consider the prediction of graduate studies success, it can be seen that study on the subject is needed. There are a number of questions which have to be considered, one being the possibility of predicting academic success in graduate studies, a second being the possibility of identifying and measuring the variables which may be involved in the prediction of success, and a third being the possibility of establishing the existence of variables which make it difficult to predict success due to the fact that they cannot be identified and isolated.

Questions Being Considered

Within this study, one major question will be considered along with a number of minor questions. The major question can be stated as follows: Is it possible to predict academic success in graduate studies? Before the above question can be considered, it is necessary to answer other secondary questions pertaining to the variables involved. These secondary questions include the following: 1) Is it possible to identify and measure those variables involved in the prediction of graduate study success? 2) Are there confounding variables which may inhibit prediction of academic success in graduate study, and can they be identified even if they cannot be measured?

Assumptions

There are a number of assumptions which this study makes in order to be carried out. First, it is assumed that the standardized tests being used -- the Graduate Record Examination, the Miller's Analogy Test, and the Minnesota Multiphasic Personality Inventory -- are both reliable and valid. It is also assumed within this study that an adequate definition of academic success can be seen as the completion of the graduate plan of study undertaken by the student, and that nonsuccess is defined adequately as those who have not completed degree requirements.

Definition of Terms

Success

This term will refer to that group of students who have completed their degree program.

Unsuccessful

This term will refer to those students who have not completed their degree program. Non-completion of the degree will be defined as those who have not completed their degree within nine semesters after their initial enrollment. The nine semester cut-off point was established by computing the mean amount of time it took the successful group to complete their degrees, the mean time necessary for completion came out to be 3.1 years. The standard deviation for the successful group was then calculated as being .7 years. Using the mean of 3.1 and the standard deviation of .7, a 95 percent confidence interval was eatablished. The upperbound of this interval is 4.3 years, which is equivalent to nine semesters, and these nine semesters were used as the cut-off for placing people in the unsuccessful group. Therefore, if a student had not completed his degree and he was admitted to the program more than nine semesters ago, he was classed as unsuccessful.

Limitations

The following may be seen as limitations of this study:

1. The population consists of students enrolled in the Graduate College in a doctoral program in the College of Education at Oklahoma State University; therefore, generalizations should be made only to similar populations.

2. Any prediction from criterion measures developed within this paper will not have a validation study done to show the effectiveness of the information obtained.

3. This study is limited to only those predictor variables which it is possible to obtain for the population; these variables include undergraduate and graduate grade point averages, Verbal and Quantitative Graduate Record Examination Scores, Miller Analogies Scores, and scores on the Minnesota Multiphasic Personality Inventory.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Over the years man has found it necessary to identify people who will succeed from people who will not at various activities. Man has for economic reasons, political reasons and even personal reasons tried to predict or at least identify those people who might succeed at a task. This need to predict success exists today in both industry and education, for neither area wishes to waste time, effort, or money in training unless there is some indication that the individual will succeed in the program or on the job.

The selection process which began at first as just a personal interview is today most often an extensive testing program leading to, in most cases, a personal interview if the applicant passes the screening tests. This process has come about due to the increase in the number of people applying for both schools and jobs. Testing to identify those who will succeed has brought about many problems, one of which is the subject of the present study, is it possible to identify people who succeed or who do not succeed through one test or a number of tests?

Research into the prediction of graduate success was brought about to a great degree by three factors in the American culture and economy (Learned, 1941), the first factor being the continuing growth of the student population within this country seeking a higher education. The

growth in student population on the college level has surpassed the capacity of the existing colleges and universities, for this reason officials in charge of admissions to both graduate and undergraduate education have sought a way of choosing among the large number of applicants. In establishing this practice they have tried to predict future performance in such a way that it would be as accurate as possible, but in most instances they have been very unsuccessful (Learned, 1941). A second reason for the increased necessity to predict performance is due to the countries and thereby the educational economy. Today educational systems are receiving smaller amounts of money from governmental and private sources for the training of promising students. It has therefore become necessary for individuals to be chosen for particular programs in a manner which will insure the greatest amount of success, thereby decreasing the amount of maney which would be wasted on a student not completing the program. In choosing students for institutes and programs, it then becomes a necessity to eliminate wastefulness and to be as successful at predicting as is possible. Lastly, and perhaps of greatest importance, is the fact that at last educators are beginning to study the educational system which they have for so long promilgated without understanding its basic workings. This means that not only are people beginning to consider how learning is accomplished and how to successfullly evaluate learning, but they are also considering the variables involved in learning. Looking at these variables immediately implies the next step, which is to take the identification of learning variables and use them as criterion upon which to base predictions (Lavin, 1965).

A number of tests which have been used to predict success in graduate school are considered in the present study, including the Graduate Record Examination, the Miller's Analogy Test, and the Minnesota Multiphasic Personality Inventory. Undergraduate grade point averages and early graduate grade point averages are also considered since past performance is often considered as a good indicator of future performance. Each test will be discussed along with information concerning its predictive ability.

What actually identifies a successful person has been defined in many different ways. Since a large number of diverse methods of determining success exist, they will be described by this author with both their positive and negative characteristics as a measure of success being considered.

Measures of Success

One of the most commonly accepted measures of success is the grade point average of the student. The use of this measure has been widely criticized and the only real justification put forth by its proponents is that it is the most readily available criterion measure. There are, then, a number of considerations which must be made before accepting grade point average as the criterion. The first consideration must be the question of whether grades really are indicators of academic performance or scholastic ability; and if the grades actually do measure academic performance, then is there not something of importance which may be learned in an academic setting which is not or cannot be measured by a grade? Lastly, there is the feeling expressed by many that often grades are not consistant between systems or even within one particular

system when grades are given by a number of different instructors. Lavin (1965) states that uncontrolled sources of variation in grades themselves may cause some of the prediction errors. Researchers have for a long time blamed the problems of prediction on man's inability to adequately measure the variables involved in predicting. Perhaps, then, what is needed is to go back and consider the grades and their variation in order to improve predictions made.

Lavin (1965) sees the variation in grades coming about due to two factors. First is the fact that not all students take the same courses from the same instructors and this means that students are exposed to different types of material. And secondly, that the curriculum in some classes may be more difficult, thereby making it more difficult to obtain high grades in these classes, while other courses are easily passed. The third hinderence to comparability of grades is the fact that teachers use different criterion for assigning grades; some give tests, some assign papers, while other require some combination of the two forms of evaluation. What this all leads to is a total lack of comparability when dealing with grades.

Beside the noncomparability of grades, another major problem exists in using grades as a measure of graduate studies success; that is, grades given in graduate study lie in a very restricted range. The great majority of graduate instructors do not give grades below B except in very unusual situations. With the range of grades being restricted to such a degree, the grade point averages of graduate students do not distinguish between those who are good and those who are poor. Another problem with the range being restricted is that the statistical technique used (most

often) to show relationship, correlation, should not be used on data which has a restricted range.

What is needed, then, in the predictive research on graduate academic success is a better criterion measure; that is, one which is more comparable, reliable, and valid than grade point average. Other criteria have been used such as faculty ratings, reported on a number of different rating scales, and personal assessment also established by some form of a rating scale or attitude questionnaire. Crawford (1942) used teacher ratings as a criterion measure of success with a group of Yale graduate students. He found that teacher ratings were an effective criterion measure for predicting graduate success. Included also as criterion measures were such areas as peer ratings, oral examination results for the dissertation, completion of dissertation, and the length of time taken to complete the degree.

Thus, it can be seen that the establishment of a better measure to identify whether an individual has succeeded or not it needed.

Predictors of Success

Once a criterion measure has been established, it is then necessary to look at the areas which have been used as predictors. The most common form of predicting is the test scores on a single test or a number of scores on a test battery, although at times other predictors are used such as personal history, previous educational records, scholastic aptitude tests, scholastic achievement tests, special ability tests, personality and interest factors, and a combination of all or part of the above (Stuit, 1949). Lavin (1965) states the following warnings about the use of tests as predictors. First, the fact that similar labels or

names on tests does not imply that the instruments are measuring the same things. It is for this reason that in some of the studies a number of tests are administered and then a factor structure is determined so that common factors between tests may be considered. This phenomena of presently available tests also functions in the opposite direction; that is, tests which seem to measure totally different areas may actually be measuring the same area. Here again, factor analysis allows experimenters to pull common factors together.

When considering predictor variables, it is necessary to be aware of the fact that the actual predictor variables might never be identified by the experimenter. It therefore, is possible to carry out research and establish variables and combinations of variables which predict without ever really identifying even one of the major predictor variables. A very real problem in prediction studies also lies in the fact that many times it is impossible to identify predictor variables, or at least to identify all of them. But even if it were possible to identify all of the variables involved in predicting, then the next consideration must be if there is an adequate test or scale for evaluating the criterion. These then are limitations which must be kept in mind when considering the effectiveness of the predictor measure.

The problem in predictive research is to determine those factors which are related to the successful performance in an activity so that the knowledge of these relationships may be used to forecast a particular individual's chances for success prior to his engaging in that activity (Stuit, 1949). It is necessary in prediction to establish the degree of relationship which exists between predictive factors and criterion. If there is a high relationship, then there will be accurate

prediction; but if there is a low relationship, then prediction will be questionable. As Stuit (1949) states, this low relationship implies that there are unknown or unmeasured factors which are more important or of equal importance with the factors which are being measured.

A number of possible trouble areas appear when the relationship between the predictors and the criterion measures of performance are considered. The first deals the the association between the variables being considered. In many of the studies, the statistical method used is correlation and the type of correlation used implies an assumption of a linear relationship. The relationship between predictive and criterion variables may be curvi-linear and pushing the variables into a linear relation may cause valuable information to be lost (Lavin, 1965). A second problem identified in a number of studies is the assumption that a high correlation totally explains the relationship; this again is untrue since all a correlation shows is a relationship. The theoretical interpretation explaining the relationship must be done by the individual interpreting the data. A correlation does not show a cause and effect relationship; therefore, once a relationship is discovered between the predictor variables and the criterion variables, it is up to the researcher to make assumptions about why the relationship exists and do follow up studies to show the relationship is true for a number of different populations.

In beginning to establish a method of predicting, one of the first considerations, of necessity, will have to be the instruments to be used to predict from. The Graduate Record Examination, the Miller Analogies Test, and in some cases the Minnesota Multiphasic Personality Inventory have all been recognized as appropriate predictor variables for admission

to graduate school. The validity studies done for all three instruments have shown that they have predictive validity; this, therefore, is not the major problem in their inability to predict those who will succeed.

The Graduate Record Examination is the test most often used to predict those who will succeed. It has been used in a number of studies which have used all forms of criterion measures, the most common being grade point average. Results using the Graduate Record Examination have been far from predictable. Newman (1968) reported a predictive validity for the Graduate Record Examination verbal of .08 and Law (1960) reported a predictive validity of .47 for the Graduate Record Examination Quantitative subscale. Other studies have shown an even wider range of predictive validities.

The Graduate Record Examination currently offers two types of instruments to assist in the selection of students for graduate study. The instruments include an aptitude test divided into verbal and quantitative sections and a group of advanced tests which cover twenty-one different areas. The Educational Testing Service, the publishers of the Graduate Record Examination, are continually performing research to establish the validity and the reliability of their tests. The Guide to the Use of Graduate Record Examination Scores in Graduate Admissions (1969-1970) stated that at the graduate level, a number of factors should be considered in the decision-making process and are important in predicting the expected success of an applicant for graduate study. It was pointed out in the guide that the major advantage to the use of Graduate Record Examination scores is that it provides a standard measure since it is administered under standard conditions to all applicants. But the

Graduate Record Examination score of the applicant should be but one element in the total picture of admissions criteria.

The reliability coefficients of .93 reported by the 1969-1970 Guide for both the quantitative and verbal sections of the Graduate Record Examination is an acceptable reliability. As with many standardized tests, one of the basic criticisms of the Graduate Record Examination is its original norming procedure, but this has been corrected and the most recent norms include data on all candidates who took the test in a three year period. The Guide also suggests that for truely valid comparison, institutions should seek to develop their own local norms.

Another major criticism of the Graduate Record Examination is that it did not conduct any study or use any of the existing literature studying the predictive validity of the test. Other types of validity were considered in many cases, not adequately but they were at least mentioned. Content validity of the Graduate Record Examination was justified in the Guide by stating that:

> The content is based on extensive experience in developing aptitude tests; and the types of questions or items used are those which have proved in a variety of studies to be related to academic success. (p. 14)

Predictive validity, states the Guide, is limited due to "the difficulty of designing and carrying out acceptable studies." Since the Guide has been published, a number of additional studies have been carried out to establish predictive validity. The results of these studies showed that the predictive validity of the Aptitude and Advanced Tests varied widely with the institution or department and with the amount of data and the number of students available.

The major criticism established by all of the reviewers in the 1960 Buros' Mental Measurement Handbook dealt with the lack of research on the predictive validity of the Graduate Record Examination Aptitude Test. Due to the above mentioned studies, Leona Tyler in the 1972 edition of Buros' Mental Measurement Handbook states:

> The Graduate Record Examinations have demonstrated some predictive validity for most of the groups and most of the situations in which they have been used and that when they are considered along with the undergraduate grade point average to predict how successful students will be in graduate programs, the prediction usually turns out to be more accurate than the undergraduate record alone. (p. 327)

Tyler goes on to state that because there was no discernable pattern in the variations noted, a general statement cannot be made about the circumstances enhancing or reducing Graduate Record Examination validity coefficients.

A number of studies using the Graduate Record Examination as a predictor variable have revealed a number of different results, ranging from the Graduate Record Examination being identified as a very good predictor to the Graduate Record Examination being identified as a very poor predictor. Hackman (1970) used grade point average as well as faculty and personal ratings on the group of graduates students in psychology. He found that the Graduate Record Examination quantitative subscale was significantly related only to courses dealing with quantitative information of some form, while the other subscales of the Graduate Record Examination, both the verbal and the advanced portion, were not significantly related to any course work. Undergraduate grade point average in psychology showed a positive relationship with grades in the first year of graduate school while the total undergraduate grade point average showed a small negative correlation with first year grades and

with the long term criterion of school completion and job success. On the two criteria measures which Hackman added, that of student self-appraisal and faculty ratings, there were significant relationships only with long term job success.

In another study presented by Hackman, Wiggins, and Bass (1970), they again measured the criterion variable at two points after one year of graduate school and then again six years later. Their results showed that the Graduate Record Examination verbal and quantitative scores were related significantly to measure of success after one year of graduate school but that only the quantitative score was significant to the long term criteria. The general results then, showed that Graduate Record Examination scores and undergraduate grade point average were related to first year success but not to the "global" assessment of success made six years after enrollment.

In another study by Roscoe and Huston (1969) at Colorado State College, they tried to determine the relevance of the Graduate Record Examination scores used as an admission standard for doctoral study. The study was different in that the investigators sought to develop new and useful criteria for identifying success. Along with graduate grade point average, other criteria variables used were: 1) graduation vs. dismissal, 2) normative judgment analysis, and 3) ipsative judgment analysis. The predictor variables included six Graduate Record Examination scores, including both the quantitative and verbal portion, as well as four different advanced tests. The findings showed that very little prediction is possible with these predictor variables. With Graduate Record Examination verbal scores, the correlations were: -.32 with grade point average, -.21 with graduate vs. dismissal, -.38 with normative judgment

analysis, and .23 with ipsative judgment analysis. Statistically, it was found that both the verbal and quantitative scores at or beyond the .01 level, due to the size of the correlation coefficients, were low enough to raise serious doubts about the predictive validity for all the Graduate Record Examination scores for this particular doctoral program.

Borg (1963) used a sample of 175 candidates for a Master of Arts Degree in Education at Utah State University and he found that a validity coefficient of .36 existed between Graduate Record Examination Verbal and graduate grade point average and a coefficient of .37 existed between Graduate Record Examination Quantitative and graduate grade point average. From these findings he stated that Graduate Record Examination tests with grade point average used as the "success" measure had little predictive value for the five year sample of graduate students attending the School of Education at Utah State University.

A study which has conflicting results with many of the above studies done at Adelphi University. The subjects for this research consisted of thirty-seven students who were completing course requirements for a doctorate in Clinical Psychology. A combination of predictor variables was used of which seven were derived from Graduate Record Examination scores and eight from undergraduate grades. These fifteen predictor variables were then compared to four criterion measures obtained from graduate grade point averages, and one which was the length of time to the completion of the oral examination, the final step in the program. Using graduate grade point average as the criterion variable, the single most effective predictor was the undergraduate psychology grade point average; this relationship was revealed by an r - .52. A multiple correlation of .50 was obtained by combining undergraduate grade point average with

Graduate Record Examination quantitative and the advanced test in psychology put out by Graduate Record Examination. As a whole, it was found that the seven Graduate Record Examination scores showed little relation to the criterion of graduate grade point average.

A number of others including Stricker and Huber (1967), Alexakos (1968), Ewen (1969), and Ayers (1971), performed research studies on graduate students using grade point average as the criterion measure and the Graduate Record Examination as the predictor variable. The results of Stricker and Huber's (1967) study showed that grade point average could best be predicted by the undergraduate grade point average of the student, and that the Graduate Record Examination subscales added little to the ability to predict grade point average. Ayers (1971) in his study using grade point average as the criterion measure, found that the best predictor variables were the New Purdue Placement Test and the students' undergraduate grade point average, and that the Graduate Record Examination did not play a part in predicting.

The Miller Analogies Test is another measure which has been used to predict success in graduate school, but here again the predictive validity of the test can be questioned. The 1962 Manual for the Miller Analogies Test reported a median correlation of .38 between Miller Analogies Test scores with grades used as the criterion measure, this is not a very substantial correlation for figuring the possibility of using the Miller Analogies Test to predict success in graduate school. Platz (1959) in a study using grade point average as the criterion found a correlation of .21 when the Miller Analogies Test was used for prediction; this is a nonsignificant finding. Other authors including Schwartz and Clark (1959), Robertson and Hall (1964), and Hyman (1957) reported nonsignificant

correlations between Miller Analogies Test scores and grade point average. These same authors also found nonsignificant results between Miller Analogies Test scores and faculty rating. Faculty rating is another form of criterion measure used, in some cases, either instead of or along with grade point average. One of the few statistically significant correlations reported was established between Miller Analogies Test scores and faculty rating in a study carried out by Waters and Patterson (1953) with Ph.D. candidates in psychology. The relationship which they obrained was .50.

The Miller Analogies Test Manual (1970) reports validity data which indicates predictive validity collected from over ten studies, performed in a number of colleges of education, to be fairly substantial. A commonly cited study perfomed by Ainsworth and Fox (1956) at Sam Houston State College in which the authors were trying to establish the Miller Analogies Test scores as a predictor of grade point ratios. Their results showed significant relationships, at the .01 level, to exist between the Miller Analogies Test scores and all the courses listed (Miller Analogies Manual, 1970).

In a study carried out by Jansen and Johnston (1969) at Wisconsin State University, 233 Master's Degree recipients were grouped according to various academic plans: 1) the professional plan -- a curriculum offering graduate specialization in areas of elementary, secondary and general school administration; 2) school services plan -- for workers in elementary and secondary counseling services; 3) teacher improvement plan -- for the classroom teacher. The correlations which resulted for each plan were as follows: .36 between Miller Analogies Test and graduate grade point average which is significant at the .01 level; . 36 between

Miller Analogies Test and graduate grade point average and this is significant at the .05 level; and the correlation between Miller Analogies Test and graduate grade point average was .38 and again significant at the .05 level. The predictive validity of undergraduate grade point average and the Miller Analogies Test are about equal when considered independently, but they are better predictors when used in combination to predict graduate grade point average.

The faculty of the College of Education at the University of California at Berkeley initiated a study of the predictive validity of Miller Analogies Test scores for their doctoral candidates. The analysis was done on 106 successful students and 64 unsuccessful students. Successful was defined as those students who received a Ph.D. or an Ed.D. in education by January, 1965 and unsuccessful was defined as those who had begun the program since 1954 and who were classified as inactive in the Dean's office. The t scores and the standard discriminant weights gave evidence that neither the Miller Analogies Test scores or undergraduate grade point average were good in discriminating between successful and unsuccessful graduate students.

Payne and Tuttle (1966) carried on research at Syracuse University on 219 students completing a Master's degree in education between July, 1958 and March, 1963. They obtained a correlation of .26 between grades and Miller Analogies Test scores and a .51 between Miller Analogies Test scores and comprehensive examination scores. This correlation coefficient justified the use, in their opinion, of the Miller Analogies Test in predicting graduate success.

A longitudinal study was carried out over a seven year period at the University of North Dakota. The success criterion used was both

grade point average and graduation versus nongraduation. These were used in the evaluation of fifteen predictor variables among which was the verbal and quantitative scales of the Graduate Record Examination and the Miller Analogies Test. The correlation between grade point average and the Graduate Record Examination verbal, quantitative, and the Miller Analogies Test was found to be negative and very small: -.01, -.01, and -.03, respectively. A correlation of .34 significant at the .01 level in this study appeared between Graduate Record Examination quantitative and graduation-nongraduation criterion; this was the only significant result on the stated predictor variables. Success on the Miller Analogies Test was not found to be related to success of the population, no matter which definitive of success was used.

One criterion which is not considered along with aptitude test to predict graduate success but which has been used as a sole predictor in a number of studies is a personality inventory. The most often used personality measure is the Minnesota Multiphasic Personality Inventory, although the Omnibus Personality Inventory (OPI) is becoming an accepted inventory also. A description of the Minnesota Multiphasic Personality Inventory and its subscales will be found in the appendix.

The Minnesota Multiphasic Personality Inventory was originally designed in the late 1930s by S. R. Hathaway and J. C. McKinley to identify psychological abnormalities in psychiatric patients. But today its use has been broadened to the use with normal individuals; in fact, it is used in a number of ways very similar to that of an aptitude test. Its purposes range today from a general screening device for students, service men, and other groups to employee selection and student counseling (Goldenson, 1970). Many studies have been done using college

populations and the Minnesota Multiphasic Personality Inventory. Kleinmuntz (1962) reviewed 179 articles of which had used the Minnesota Multiphasic Personality Inventory on college populations between the years 1947 and 1961. He found that at first, the experimenters were interested in determining and identifying types of maladjustment commonly found in college students, but later research fell more along the lines of using the test to predict college academic performance of various groups. Another common use for the Minnesota Multiphasic Personality Inventory in the past few years has been the identification of adjusted and maladjusted college students. Kleinmuntz (1960, 1963) has developed a technique using the Minnesota Multiphasic Personality Inventory in which he is able to identify 91 percent of the adjusted students and 84 percent of the maladjusted students. Kleinmuntz's study dealt with undergraduates as does a large amount of the research, even that dealing with prediction, has been concentrated on undergraduate rather than graduate population; therefore, in many cases the research is unable to be applied to graduate populations.

A large number of studies using the Minnesota Multiphasic Personality Inventory as a measure for prediction of academic success has been carried out by L. E. Drake and his associates. In an experiment attempting to identify underachievement in undergraduates (Drake, 1956), he found high scores on scales 8 (schizophrenia) and 9 (hypomenia) paried with low scores on scale 0 (Si) was the profile pattern which could be used to identify a "lack of academic motivation group." In a second study (Drake, 1957), he found still another facit of the "lack of motivation group" and that was a low score on scale 5 (masculinity-feminity) along with the initial combination. He found that those students with a high score on

the fifth scale, even if they meet the initial criterion of high scores on scales 8 and 9 and a low score on 0, they were not significantly different than the total group of freshmen when grade point average was the comparison. Drake (1962), in a third study, found that scale 4 might also be used to identify the low achievers in combination with scale 9 and 5. Drake's studies all dealt with incoming freshmen and undergraduate grade point averages at a number of points in the students undergraduate career. It is possible that studies such as the three mentioned and others carried out by Yeomans and Lundin (1957), Barger and Hall (1964), and Krippner (1964), which have come to similar conclusions, might be useful in identifying factors of personality as measured by the Minnesota Multiphasic Personality Inventory which might effect graduate school success.

Rather than using grade point average as the measure of success, as has been done in all of the above mentioned studies, it is possible to use graduation or non-graduation as the measure of success. Again using undergraduate student studies by LaBue (1953) and Ashbrook and Powell (1967), no significant pattern in the Minnesota Multiphasic Personality Inventory scores between those who graduated and those who failed to graduate from a number of different colleges was found. Drasgow and McKenzi (1958) in another study found results similar to Drake's third study (1962), where non-graduates were high on scales 4 (psychopathic deviate) and 9 (hypomania). They interpreted this finding to indicate that these students had difficulty in achieving long-term goals, this being the reason for the non-graduation of the students. There is, then, on an undergraduate level some similarity of scales which can identify

those students who are not successful in school whether the success measure is grade point average or graduation.

One of the very few studies which used the Minnesota Multiphasic Personality Inventory in the prediction of graduate success, was performed by Barthol and Kirk (1956) in a public health education program. In this study, the Minnesota Multiphasic Personality Inventory was only one in a battery of tests given to entering students. The results indicate that the Minnesota Multiphasic Personality Inventory scores were useful as negative screening techniques. They identified those students who were unsuccessful in the program as measured by faculty ratings of students. The cutoff point used in the study was a standard score above 70, except on the scale 5 which was eliminated. A follow up study was done with the first class of graduates from Barthol and Kirk's study six years after graduation. A professional work history was obtained and the Minnesota Multiphasic Personality Inventory was given over. The results indicated that those successful on their jobs showed an increase in the mean score on every scale but 3 (hysteria). The least successful on the job showed a decrease on every scale. There were only 3 scales on which the interactional differences were significant; these were scales 3, 7, and 8.

The most consistent finding which occurs throughout all the literature whatever the measure of success and whether it was graduate or undergraduate students being studied was the high scores on scale 5 (masculinity-feminity) being associated with success. Across a number of studies, this finding appeared. Drake (1956) found high grade point average students had high scores on scale 5, Barger and Hall (1964) found the top quarters of freshmen and senior classes had high scores on

scale 5, Yeomans and Lundin (1957) and Lundin and Kihn (1960) backed up the findings. In fact, there has not been one study reviewed which invalidated this finding, although some showed no significant relationship. Another consistent finding throughout the literature on the Minnesota Multiphasic Personality Inventory is that high scores appearing in scale patterns of 8, 9, and 4, 9, and 8 differentiated those students with low grade point averages from those with high grade point averages. Again, these patterns of high scores appeared over a number of studies and have proved useful in the prediction of success at least on an undergraduate level.

Summary

All of the studies and research reviewed showed the large number of tests and rating scales used as predictors of academic success. Houston (1968) used twenty-one judges to identify how much weight to put on various predictors and found a high interjudge reliability on the rating scales used as well as the possibility through judges, to identify some of the variables involved in success. But every study has some variance in the prediction which cannot be accounted for, and until prediction can be made in such a way that all the variance is explained, there are factors working which are not being identified. As Lavin (1965) states, a correlation of .80 can explain only about two thirds (64%) of the variance; there is still one third of the variance which is not explained in the correlated relationship.

A number of limitations exist within the research on the Graduate Record Examination and the Miller Analogies Test scores to predict graduate success. The procedures used by many of the experimenters could

not allow for the wide ranging conclusions which were often times reached. The most common limiting factor in making generalizations was the small size of the samples dealt with. Very few of the studies were carried out over time, this again limiting the generalizability of obtained results.

The largest problem was given by the inability to define a criterion variable which would be useful. If grade point average is used as the criterion measure, what about the restrictedness of the range? Faculty and peer ratings were often found to be of little value since many were influenced by predictor variables. These types of ratings are often not well standardized and are at best a very subjective measure of the individual. Comprehensive examinations had a number of problems associated with them including the fact that they are not standardized, the tests differ between schools, and the time of administering differs between schools.

In considering both the Graduate Record Examination and the Miller Analogies Test as aptitude tests for use as predictors of graduate success, it can be said from the available research that neither can successfully predict graduate success. But the correlation coefficients for the Miller Analogies Test are consistently higher with criterion measures than the Graduate Record Examination. The Miller Analogies Test has also had a greater amount of work done by its developers in the areas of predictive validity than the Graduate Record Examination, although some of the more recent publications (Crawford, 1972) show the beginnings of increased information on predictive validity.

The amount of variation in graduate school achievement, which is explained by any measure of aptitude is not greater than 15 percent,

this figure is across all different types of aptitude measures. This figure, being so small, can best be used as one weighted component toward prediction of graduate success with other criterion measures adding information to explain a greater amount of the variation in graduate school success.

From a review of the available literature, it can be seen that the Minnesota Multiphasic Personality Inventory has no empirical evidence dealing with the validity of its predicting success of graduate students. Of course, it is also true that the Minnesota Multiphasic Personality Inventory as an instrument was not designed to predict academic success. It is then necessary to determine what use will be made of a personality inventory in graduate school. It may be used to predict success or it may be used to identify pathology in entering students. If it is used to predict, then more research should be conducted to establish unquestionably the scales which are valid and reliable for this practice.

What has been found, then, is that the results are conflicting and confusing. A redefinition might help, for both the predictor and the criterion variable. And new research to identify extraneous variables is also necessary.

CHAPTER III

METHODOLOGY AND PROCEDURES

Purpose of the Study

The purpose of this study was twofold. The first consideration was to determine if a combination of information from tests and past academic performance could be used to identify those who would be successful in graduate school. The second consideration dealt with identifying variables that might not be measured but which hinder the identification of those students who succeed in graduate studies.

Subjects

The population used in this study consisted of two hundred and forty-seven students who had been accepted by the Graduate College in Education at Oklahoma State University within the last seven years, from the Spring semester, 1966 to the Spring semester, 1973. The population was divided into two groups, the first group consisting of those students who have received a degree; this group was designated as the successful group. The second group consisted of those students who had not completed their programs. A number of the students appearing in this group were those who had been at the University less time than would be possible for a degree to be completed. Unrealistic information would have been established if these students' test scores were kept in the

unsuccessful group, for a majority of them given a realistic amount of time will complete their degrees. Due to this problem, the author developed a procedure for admitting people to the unsuccessful group. First, the mean number of years it took the successful group to complete their degrees was calculated. The average number of semesters taken by the successful group was six, the standard deviation of the group was determined to be .7 years; this gave an indication of the spread of scores. A confidence interval of 95 percent set up around the mean of the successful group yielded an upperbound of 4.3 years or nine semesters. This upperbound of nine semesters was used as the cutoff point for classifying people as unsuccessful; therefore, anyone who had been enrolled in graduate study for more than nine semesters became a member of the unsuccessful group. Any person who had not completed a degree and also has not been at Oklahoma State University for more than nine semesters was not included in either group.

The size of the sample was affected by two major factors; the first being that students not meeting the time criterion used in the establishment of the unsuccessful group were eliminated from the study; that is, any student still working on a degree who has been at Oklahoma State University for less than nine semesters was eliminated. The second factor affecting the size of the sample was that in examining the records of the students involved in the study, it was found that different tests were required at different times of entry. Therefore, no one student ever had all of the tests under consideration (the Graduate Record Examination, Verbal and Quantitative, Miller Analogy Test, and Minnesota Multiphasic Personality Inventory), but undergraduate and graduate grade point averages could be obtained for most of the students.

When using the grade point averages in combination with a test, the number of students with the test result determined the number of people in the sample. The total number of students involved in each correlation matrix, therefore, is different due to the above mentioned factor, of the lack of the same test score results for each student.

Methodology and Design

The main purpose of the present study was to identify variables which can be used in some combination to determine a valid prediction of success in graduate school. Two groups were established, one group consisting of those students who have received a degree from the College of Education and regarded as having successfully completed their graduate studies, the other group made up of students who had not completed requirements for graduation.

The records showed that most students entering graduate school had test scores on the Graduate Record Examination, the general portion consisting of both verbal and quantitative subscales, with only a few having scores on any advanced test of the Graduate Record Examination. Some students had scores on the subscales of the College Level Examination Program Battery, the Purdue Placement Test, the Cooperative General Cultural Test, the Watson-Glaser Critical Thinking Test, the Miller Analogies Test, and a personality measure in the Minnesota Multiphasic Personality Inventory. Most students' records also contain both their undergraduate grade point average and their graduate grade point average up to the point of admitance. These data were collected for all students who had completed their degrees at Oklahoma State University

graduate school in Education from Spring semester, 1966 to Spring semester, 1973.

The data were obtained during the Fall semester of 1973 from the files kept in the College of Education according to the year and semester the degree was granted. Information for those students in the unsuccessful group was obtained from both the active and inactive files of graduate students in the College of Education. The information contained within individual students' files varied depending upon the student, the year and semester he began his graduate study, and the program within the College of Education the student entered.

Procedure and Statistical Analysis

Scores on the Graduate Record Examination, both its verbal and quantitative subscales were obtained for the sample as well as scores on the Miller Analogies Test, and the thirteen subscales of the Minnesota Multiphasic Personality Inventory. For each subject other information gathered was undergraduate grade point average and graduate grade point average at the time of entrance. A number of other test results were obtainable including the Purdue Placement Test, the Cooperative General Culture Test, the College Level Examination Program Battery, and the Watson-Glaser Critical Thinking Test, but this information was scattered among students. Due to the fact that such a limited number of students had this second group of tests, they will not be considered in this study as predictor variables.

The statistical analysis used in this study was a correlational technique. Pearson Product Moment Correlations were obtained between variables including undergraduate and graduate grade point average,

Graduate Record Examination Verbal and Quantitative subscales, Miller Analogies Test, and the Minnesota Multiphasic Personality Inventory. The correlations were determined for the successful and the unsuccessful group separately, and correlations were not made between the two groups due to the dictumous nature of the variable. Rather, correlations among and between the predictor variables have been carried out for those students who are in the successful group and then those students in the unsuccessful group. Means and standard deviations are also obtained for each of the predictor variables for both groups and these means were then compared to give added information. A t-test was used in comparing the means between the successful group and the unsuccessful group. The t-values allowed for the comparison of the means between the successful and unsuccessful group. The t-value should be used simply to describe the difference between the two groups and nothing further since there were no experimental procedures carried on.

The data such as the correlation matrices, the t-values and the means and standard deviations are also presented in table form and discussed in Chapter Four. A brief description of each of the tests and subscales is presented in the appendix in order that the reader will have an understanding of the correlations and comparisons being presented. The levels of significance reported for the correlations and t-values are not meant to be used to test a hypothesis, rather they are included to give the reader a greater understanding of the numbers being presented. Since the function of the present study is to describe the population and the relationships between the variables, the levels of significance are included to help better describe the population. For this reason critical significance levels are not set up but rather the actual

probability level of the various relationships is given, allowing the reader to decide for himself the importance of the relationship.

CHAPTER IV

RESULTS

The question being considered in this research concerns identifying variables which may indicate, in a positive manner, those students who will remain in a graduate program at the doctoral level until they have completed their degree. The variables dealt with are standardized test scores and grade point averages obtained from the files of those students entering the College of Education, Graduate School at Oklahoma State University from the Spring of 1966 to the Spring of 1973. The test scores obtainable from the files included the Miller Analogies Test, Graduate Record Examination scores on both Verbal and Quantitative subscales, and scores on the thirteen subscales of the Minnesota Multiphasic Personality Inventory; also obtained from the files were the students' undergraduate and graduate grade point averages. Not all this information was available for each student, but a majority of the students had at least part of the information mentioned above. Analysis of the obtained data established relationships between variables and identified those variables which seem to differential between the successful and unsuccessful groups.

Data for this study were collected from October of 1973 through December of 1973 and were obtained from the files of those students admitted to the Graduate College in Education at Oklahoma State University from Spring of 1966 to Spring of 1973. The total sample consisted

of 247 students, of that number 186 were classified as successful, being those students who had finished their degrees, and 61 were classified as unsuccessful, being those students who had not finished a degree and had met the other criterion being used in the previous chapters. The successful group, therefore, consisted of approximately 75 percent of the total sample, while the unsuccessful group contained about 25 percent of the total sample.

The statistical analysis used in this study was a Pearson Product Moment Correlation between different combinations of the variables. The variables in this case being the undergraduate group point average, the graduate grade point average, the Minnesota Multiphasic Personality Inventory, the Miller Analogies Test, and the verbal and quantitative portions of the Graduate Record Examination. Each table contains three correlation matrices, the first correlation matrix in each set of three gives information concerning the total number of students with scores on the variables being considered. The second correlation matrix represents information dealing with those students who are in the successful group on the set of variables being considered. And the third correlation matrix deals with the same set of variables and gives information for those students who have been classified as unsuccessful. Below each matrix is the number of students involved in that particular correlation matrix. Within each table, the level of significance is reported, if it is greater than .10, in order that the reader may consider the probability level for each statistic given. Therefore, if a probability level is not listed after the correlation coefficient, then the level of significance fell below the level of .01.

Statistics

Table I indicates that there is a relationship between undergraduate and graduate grade point average for both the successful group and the total group. The correlation of .17 reported from the unsuccessful group shows a much smaller relationship than exists in the successful or the total group. The unsuccessful group then shows a much smaller relationship between the grades received in undergraduate school and those received in graduate school than the successful group.

TABLE I

CORRELATION MATRIX BETWEEN U-GPA AND G-GPA

	U-GPA	G-GPA
Total		
U-GPA	---	.31 p=.001
G-GPA		
N=245		
Successful		
U-GPA	---	.41 p .001
G-GPA		
N=184		
Unsuccessful		
U-GPA	---	.17 p=.08
G-GPA		
N=61		

Table II reveals that the relationship between the Miller's Analogies undergraduate grade point average is so small in all three groups that it is for all intensive purposes nonexistent. But the relationship between the Miller's and graduate grade point average shows that there is a much greater relationship in the unsuccessful group, with the correlation being .33, then in either the successful group on the total group, since both these correlations are below .22.

TABLE II

CORRELATION MATRIX BETWEEN U-GPA, G-GPA, AND MAT

	Miller	U-GPA	G-GPA
Total			
Miller N=68	---	.02	.18
Successful			
Miller N=54	---	.06	.12
Unsuccessful			
Miller N=14	---	-.05	.33

Table III indicates that a high correlation exists between the verbal and the quantitative scores on the Graduate Record Examination irregardless of the group being considered. These relationship all show

significance levels greater than .02. The only other correlation coefficient which appears to show a rather meaningful relationship is that between undergraduate grade point average and the quantitative portion of the Graduate Record Examination in the successful group. All of the other correltion coefficients are too small to indicate any type of meaningful relationship.

TABLE III

CORRELATION MATRIX BETWEEN U-GPA, G-GPA, V-GRE, AND Q-GRE

	V-GRE	Q-GRE
Total		
U-GPA	.14	.16
G-GPA	.13	.01
V-GRE	---	.44 p=.001
Q-GRE		---
N=59		
Successful		
U-GPA	.23	.33 p=.08
G-GPA	.10	.03
V-GRE	---	.45 p=.015
Q=GRE		---
N=29		
Unsuccessful		
U-GPA	.05	-.06
G-GPA	.08	.03
V-GRE	---	.50 p=.001
Q-GRE		---
N=30		

A number of the subscales of the Minnesota Multiphasic Personality Inventory are shown to be highly interrelated in all three of the groups (successful, unsuccessful, and total). Table IV A, B, and C indicates the intercorrelations of the Minnesota Multiphasic Personality Inventory. It can be seen that those people in the unsuccessful group showed many few meaningful intercorrelations between the subscales than did the other two groups. The significance levels reported within Table IV A, B, and C is effected by the large variation in sample size, with the unsuccessful group having a much smaller sample size than the successful group; the correlation coefficients need to be higher to indicate significance.

Similar in the graduate grade point average for the successful group at the .01 level of significance, the relationships were significant for scale 9 and the F scale of the Minnesota Multiphasic Personality Inventory. Scale 1 of the Minnesota Multiphasic Personality Inventory correlated significance with graduate grade point average at the .05 level for the successful group. In the unsuccessful group, three significant relationships were found at the .01 level between the graduate grade point average and scale 2, scale 4, and scale 9 of the Minnesota Multiphasic Personality Inventory. At the .05 level, scale 1 of the Minnesota Multiphasic Personality Inventory and the graduate grade point average showed a significant relationship for the unsuccessful group. With this data also, the unsuccessful group is much smaller in size than the other two group. This fact may then be reponsible for fewer correlations being significant above the .10 level.

TABLE IV-A

CORRELATION MATRIX BETWEEN SUBSCALES OF THE MMPI

Total

	L	F	K	1	2	3	4	5	6	7	8	9	0
L	---	39*	66*	48*	29*	18***	45*	65*	13	06	31*	00	65*
F		---	34*	42*	41*	22**	50*	40*	07	42*	04	33*	10
K			---	50*	23**	32*	40*	49*	18***	-11	21**	-01	60*
1				---	15	19***	53*	65*	38*	-12	09	18	51*
2					---	04	30*	26*	11	29*	-02	01	08
3						---	35*	28*	10	-04	-03	14	27*
4							---	73*	22**	21**	10	27*	39*
5								---	28*	-03	23**	18	69*
6									---	-22**	-03	07	07
7										---	04	26*	-28*
8											---	-12	46*
9												---	-15
0													---

N=127
*p .01
**p .05
***p .10

TABLE IV-B

CORRELATION MATRIX BETWEEN SUBSCALES OF THE MMPI

Successful

	L	F	K	1	2	3	4	5	6	7	8	9	0
L	---	41*	71*	54*	32*	28*	52*	68*	18***	05	36*	06	72*
F		---	38*	47*	40*	26**	58*	47*	08	47*	05	45*	21**
K			---	55*	27*	32*	51*	59*	25**	-03	23**	-03	65*
1				---	19***	27**	60*	73*	42*	-09	13	25**	60*
2					---	11	37*	30*	12	35*	03	17	15
3						---	43*	37*	15	03	-13	09	31*
4							---	78*	26**	24**	11	35*	50*
5								---	30*	-06	28*	24**	78*
6									---	-25**	04	02	15
7										---	10	33*	-23**
8											---	-21	47*
9												---	-09
0													---

N=86
*p .01
**p .05
***p .10

TABLE IV-C

CORRELATION MATRIX BETWEEN SUBSCALES OF THE MMPI

Unsuccessful

	L	F	K	1	2	3	4	5	6	7	8	9	0
L	---	28***	43*	27***	21	12	17	55*	-10	11	24	-15	48*
F		---	13	23	37**	07	21	16	-15	39*	13	12	-18
K			---	30**	11	33**	-07	15	-09	-32**	18	00	49*
1				---	05	00	29***	45*	31**	-17	05	08	30**
2					---	-19	18	17	02	21	-01	-26***	-03
3						---	1 2	08	-06	-15	27***	19	21
4							---	58*	07	17	09	17	06
5								---	22	01	12	10	48*
6									---	-19	-18	14	-14
7										---	-06	18	-36**
8											---	05	43*
9												---	-22
0													---

N=41
*p .01
**p .05
***p .10

TABLE V

THE CORRELATION MATRIX BETWEEN THE SUBSCALES OF THE MMPI AND U-GPA AND G-GPA

	Total		Successful		Unsuccessful	
	U-GPA	G-GPA	U-GPA	G-GPA	U-GPA	G-GPA
L	-03	-12	-02	-10	02	-15
F	-19**	-27*	-22**	-35*	-20	07
K	04	-03	06	-02	-05	-12
1	-19**	-24**	-15	-26**	-36**	-32**
2	16***	10	18***	08	21	29***
3	-03	-02	00	-05	-16	02
4	-06	-14	-05	-13	-14	-29***
5	-10	-10	-06	-09	-23	-15
6	-18***	-08	-19***	-14	-13	06
7	17***	03	15	04	15	-19
8	-04	00	-02	01	-13	07
9	-22**	-27*	-19***	-38*	-38**	-27***
0	-03	-05	03	-05	-15	01

N=124	N= 83	N=41
*p .01	*p .01	*p .01
**p .05	**p .05	**p .05
***p .10	***p .10	***p .10

Table VI indicates that when considering the successful group, the Verbal portion of the Graduate Record Examination correlates significantly with the F scale, scale 3, and scale 8 of the Minnesota Multiphasic Personality Inventory. The Quantitative portion of the Graduate Record Examination showed a significant relationship with the F scale and scale 7 and with the Verbal portion of the Graduate Record Examination when looking at the successful group. In considering the unsuccessful group, the Verbal portion of the Graduate Record Examination showed a significant relationship with scale 8 of the Minnesota Multiphasic Personality Inventory only and the Quantitative portion of the Graduate Record Examination appeared significant with scale 1 and scale 8 of the Minnesota Multiphasic Personality Inventory and with the Verbal portion of the Graduate Record Examination.

A second statistical procedure was employed which established the means and standard deviations for each of the variables. These means and standard deviations are shown in Table VII and were computed from all scores obtained for that variable. Not much information can be gained by visually comparing the means. A series of t-tests were computed in order to see if any of the differences in means between the successful and the unsuccessful groups could be considered significant. Although this was a descriptive study and not an experimental study and a t-test is not an appropriate statistic to be used in a descriptive study, the researcher used the statistic to show magnitude of difference and not to imply a causal relationship. When used only to describe more clearly the two population differences, the t-statistic is not being misused and therefore, was employed. Table VII also contains the t-value for each of the

successful-unsuccessful pairs on each of the variables. The probability level for each t-value appears below the value.

TABLE VI

THE CORRELATION MATRIX BETWEEN THE SUBSCALES OF THE MMPI, THE V-GRE, AND THE Q-GRE

	Total		Successful		Unsuccessful	
	V-GRE	Q-GRE	V-GRE	Q-GRE	V-GRE	Q-GRE
L	06	09	10	11	-07	05
F	15	17	37**	38**	-20	-15
K	09	00	10	-01	03	02
1	05	-20	10	-05	-09	-44
2	09	14	31***	23	-24	06
3	-10	-03	04	-02	-29	-06
4	13	21	22	30	-01	03
5	10	22	13	20	02	23
6	-18	-23	-26	-38**	-05	00
7	19	09	31**	26	13	-11
8	-32**	-22	-03	-10	-67*	-40
9	13	06	27	28	-05	-15
0	-12	03	-11	00	-20	07

N=50		N=29		N=21	
*p	.01	*p	.01	*p	.01
**p	.05	**p	.05	**p	.05
***p	.10	***p	.10	***p	.10

TABLE VII

THE MEANS, STANDARD DEVIATIONS, AND t VALUES OF THE VARIABLES

Variable	N	Mean	SD	df	t
U-GPA					
Total	245	2.85	.468		
Successful	184	2.89	.466	243	1.440
Unsuccessful	61	2.79	.468		p = .14
G-GPA					
Total	245	3.51	.269		
Successful	184	3.50	.269	243	- .752
Unsuccessful	61	3.53	.270		p = .29
Miller					
Total	68	45.59	13.724		
Successful	54	45.17	12.310	66	- .493
Unsuccessful	14	47.21	18.692		p = .41
V-GRE					
Total	59	487.73	86.240		
Successful	29	468.48	81.623	57	-1.713
Unsuccessful	30	506.33	87.827		p = .08
Q-GRE					
Total	59	501.86	124.436		
Successful	29	514.48	116.942	57	.763
Unsuccessful	30	489.67	132.104		p = .31
MMPI (L)					
Total	127	11.4	2.450		
Successful	86	11.28	2.659	125	- .816
Unsuccessful	41	11.66	2.653		p = .28
MMPI (F)					
Total	127	16.98	3.389		
Successful	86	16.55	3.622	125	-2.129
Unsuccessful	41	17.90	2.653		p = .03
MMPI (K)					
Total	127	20.5	4.119		
Successful	86	20.31	4.533	125	- .728
Unsuccessful	41	20.88	2.092		p = .29
MMPI (1)					
Total	127	21.35	4.151		
Successful	86	21.19	4.334	125	- .659
Unsuccessful	41	21.71	3.763		p = .37

TABLE VII (CONT.)

Variable	N	Mean	SD	df	t
MMPI (2)					
Total	127	28.48	7.273		
Successful	86	27.38	6.965	125	-2.514
Unsuccessful	41	30.78	7.451		p = .02
MMPI (3)					
Total	127	9.35	2.533		
Successful	86	9.14	2.507	125	-1.335
Unsuccessful	41	9.78	2.564		p = .12
MMPI (4)					
Total	127	24.71	4.063		
Successful	86	24.73	4.497	125	.091
Unsuccessful	41	24.66	3.005		p = .65
MMPI (5)					
Total	127	23.10	4.285		
Successful	86	23.01	4.439	125	- .343
Unsuccessful	41	23.29	3.989		p = .46
MMPI (6)					
Total	127	18.28	3.874		
Successful	86	18.06	4.111	125	- .911
Unsuccessful	41	18.73	3.324		p = .23
MMPI (7)					
Total	127	22.13	8.089		
Successful	86	22.14	7.396	125	.013
Unsuccessful	41	22.12	9.479		p = .65
MMPI (8)					
Total	127	3.39	2.319		
Successful	86	3.65	2.387	125	1.879
Unsuccessful	41	2.83	2.120		p = .07
MMPI (9)					
Total	127	2.21	2.002		
Successful	86	2.07	1.679	125	-1.159
Unsuccessful	41	2.51	2.551		p = .22
MMPI (0)					
Total	127	18.32	4.407		
Successful	86	18.48	4.434	125	.596
Unsuccessful	41	17.98	4.384		p = .39

It can be seen from Table VII that a number of the t-values are negative which means that the unsuccessful group had higher scores on these variables than the successful group. The most significant t-values appear to show that there was a significant different at the .05 level between the Graduate Record Examination Verbal, the Minnesota Multiphasic Personality Inventories F, 2, and 8 and all of these but the last are negative relationships implying that the unsuccessful group had significantly higher scores than the successful group.

Other interesting results appeared between the undergraduate grade point average which was significant at the .10 level and the Minnesota Multiphasic Personality Inventory scale 3 which was significant at the .10 level. At the .15 level of significance, the Minnesota Multiphasic Personality Inventory scale 9 is of interest. Other t-values may be compared with their probability levels which lie below them in Table VII.

CHAPTER V

SUMMARY, CONCLUSIONS, AND DISCUSSION

Summary

The primary purpose of this study was to identify measures which could be used to predict success in graduate school. The predictor tests being considered were the Graduate Record Examination for both its verbal and quantitative scales, the Miller Analogies Test, the Minnesota Multiphasic Personality Inventory, and other predictors including undergraduate and graduate grade point average.

The records of two hundred and fourty-seven graduate students in the College of Education were divided into two group, those who received their degrees and those who had been admitted to school more than nine semesters earlier and had not completed their degrees. These two groups, those labled as successful and those labled as unsuccessful, were then used as the criterion measure. The data obtained from the files was analyzed using the Pearson Product Moment and the scores on the various predictor measures were compared within each of the groups. The two groups were compared using a t-test to indicate the differences between the means.

Conclusions

On the basis of the research, the questions under consideration can begin to be answered. First, because a number of significant

relationships were found within the successful group and not within the unsuccessful group, it can be said that some of the predictor variables do in actuality identify variables involved in the prediction of success. The Minnesota Multiphasic Personality Inventory showed that a significant difference existed between the means of the two groups on three of the subscales, the F scale in which high scores indicate carelessness and confusion, the Depression Scale in which high scores indicate shyness, dispondence, and distress, and the Schizophrenia Scale in which high scores indicate withdrawn and unusual people. On the first two scales, the successful groups mean was lower than the unsuccessful group and on the third scale, the opposite was true.

Of the measures of achievement and aptitude, the Miller Analogies Test had the least difference between the successful and unsuccessful group. The undergraduate grade point average appeared to be higher in the successful group than the unsuccessful group, while the verbal Graduate Record Examination showed a higher mean for the unsuccessful group than the successful group. The other predictor variables when means were compared appeared to reveal little information of use in identifying the two groups, or in predicting the people who would belong in both groups.

Correlations between the predictor variables within each group separately revealed that the magnitude of the relationship between Graduate Record Examination scores was greater within the successful group than the unsuccessful group. This finding was also true of the undergraduate and graduate grade point averages, with the relationship being much greater in the successful group than the unsuccessful group. The Miller Analogies Test showed little relationship with other measures

and the relationship which did appear was similar between the two groups. The Minnesota Multiphasic Personality Inventory showed similar results with the relationships between scales geing greater for the successful group than the unsuccessful group. All of these findings indicate that there tends to be a greater conformity of scores in the group of students falling in the successful group than in the unsuccessful group.

Discussion

The correlation coefficients displayed in Tables I through VI in Chapter IV show some interesting relationships. Table I point up the fact that there is a relationship between a student's undergraduate grade point average and his graduate grade point average within the successful group. Most research in the field agrees with this finding for it is felt by many authorities that undergraduate grade point average is one of the better indicators of graduate grade point average. The point which is of interest in this table is that the significant relationship does not appear within that group which has not completed their degrees. This result seems to indicate that people who went on the complete their doctoral degree tended to show a greater relationship between their grade point average as undergraduates and their grade point averages obtained during the first few semesters as graduate studies. To say that there is a significant relationship between undergraduate grade point average and graduate grade point average in the successful group is to say that there is a trend for both measures to be at similar points along the grade point average continuum. Since the relationship is a positive one, it is also possible to say that they vary in the same direction. The relationship in the unsuccessful group, which is not as high

in the successful group, tends to imply that there is no identifiable trend. It can also be seen from the correlation obtained in the unsuccessful group that only 2.9 percent of the variation is explained in this group. While in the successful group, approximately 16.8 percent of the variation can be accounted for by the correlation coefficient. This result appears to be one which many others have obtained and it appears to this author to be a logical basis upon which to begin to establish a method for identifying those people who will succeed.

Another point of interest is that very little relationship exists for either the successful or unsuccessful group when looking at the undergraduate grade point average and the Miller's test scores. It is, therefore, possible that there must be some difference between the information given by undergraduate grade point average and graduate grade point average since there is a greater amount of relationship shown with the graduate grade point average. Considering the unsuccessful group the greater amount of relationship exhibited by the Miller's with the graduate grade point average is interesting in that it differs from much of the previous research. If further study shows similar results, then the Miller Analogies Test could be of little use in the prediction of success.

A second test used to predict graduate success by many authors is the Graduate Record Examination. The Quantitative sub-score is highly related to the Verbal sub-score for both the successful and the unsuccessful groups. In this case, both groups have similar sample sizes so the correlation coefficients have meaning when they are visually compared. The Verbal sub-score on the Graduate Record Examination does not correlate with the undergraduate or the graduate grade point average within either group. The verbal subscale of the Graduate Record Examination

then appears to be of little use predicting those students who will complete their degrees. On the other side, the Quantitative subscale appears to be very important in the prediction of success, since it is significant with not only the Verbal Graduate Record Examination but also with the students' undergraduate grade point averages in the successful group. In the unsuccessful group, though, there is no relationship evident with either the undergraduate or the graduate grade point average. It appears from the results that the Quantitative subscale can be of use in identifying those persons who continue on the complete thier degrees since it is of greater consistency in the successful group. The verbal subscale appears to be of little use since it identifies no type of relationship within either group. In looking at the means of the two subscales it can be seen that the unsuccessful group has a higher mean than the successful group. The t-test revealed a relatively significant difference between the means. This finding is of interest since it indicates that those people who are not completing their degree appear to be more verbal than those completing their degrees. One explanation lies in the selection process which in many cases puts more emphasis on choosing people who have better scores on the quantitative scale. This same type of finding exists with the Miller Analogies Test in that the mean of the unsuccessful group is higher than that of the successful group. The difference between the means on the Miller is not as significant as that on the Graduate Record Examination but it is still indicating findings which are opposite to what would be expected.

In considering the Minnesota Multiphasic Personality Inventory (Table IV), it gives information on the interrelations between the subscales of the Minnesota Multiphasic Personality Inventory. One of the

first things which is immediately noticeable upon looking at the data is that a great many more correlations are significant in the successful group than in the unsuccessful group. It can also be seen that the significant correlations in the successful group are all positive while in the unsuccessful group a number of the significant correlations are negative. What is actually being said is that internal consistency within the successful group is higher than that within the unsuccessful group.

In considering the scale, it should be pointed out that the L, F, and K are validity scales and for this reason it is logical that they should correlate highly with all of the other scale. An interesting finding is that even with these scale, a large difference exists between the successful and the unsuccessful group. The successful group has a small number of scales which do not correlate significantly, while with the unsuccessful group, a great number of scales do not correlate significantly with the validity scales.

The one thing which stands out is that in the successful group, scales 4, and 5, Psychopathic and Masculinity-Femininity, are correlated highly with almost all of the other scales in the successful group. This finding is not so in the unsuccessful group, where scales 4 and 5 are significantly related with only a couple of other scales. High males on scale 5 are described as aesthetic and sensitive, while high females are described as rebellious and unrealistic. High scores on scale 4 are described as adventurous, courageous, and generous. Previous research dealing with the use of the Minnesota Multiphasic Personality Inventory to identify successful students has shown that high scores on scale 5 tend to be a good indicator of those who will succeed in graduate school.

It appears from the present study that scale 5 correlates with more scales and with greater magnitude with those students who succeed than with those students who do not succeed.

Some interesting results, and ones which perhaps are more meaningful, can be derived from considering what is being presented in Table V in Chapter IV. The correlations listed here are the relations between the Minnesota Multiphasic Personality Inventory subscales and undergraduate and graduate grade point average for both the successful group and the unsuccessful group. In the successful group, undergraduate grade point average is related significantly only to the F scale, in which high scores suggest carelessness and confusion. The relationship is negative; this then implies that they are moving in opposite directions, meaning that person with a high grade point average scores low on the F scale, thereby exhibiting those characteristics to a lesser degree. The same relationship exists between the F scale and the graduate grade point average. The graduate grade point average is also related significantly and negatively to scale 1, whose high scorers are classes as cynical, defeatists, and crabbed, and on scale 9, whose high scorers are described as sociable, energetic, and impulsive. In the unsuccessful group, these types of relationships also existed with the undergraduate grade point average being negatively related to scales 1 and 9 while the graduate grade point average was negatively related to only scale 1.

After having considered all of the correlational data, this author felt that a knowledge of the means and standard deviations of the successful and unsuccessful groups across all the obtained measures would be helpful to the reader. In order to gain a feel for the relationships between the means for the two groups, t-tests were calculated comparing

the successful group with the unsuccessful group on each measure used. Table VII in Chapter IV contains the data with the t-values and the probability level each of those t-values is at. Two or three stand out as being important and may be of used in identifying people who will not succeed. The first is the undergraduate grade point average which has a fairly high and positive t-value. This means that undergraduate grade point average is higher in the group which succeeded than in the unsuccessful group. Graduate grade point average had a very small t-value and it was also negative, which said that the graduate grade point average of the unsuccessful group tended to be higher than that of the successful group. This is another interesting finding for it is saying that it is not necessarily those people who cannot make the grade who are not finishing the program. It also points out the fact that those studies using grade point average as the criterion measure may not be giving accurate information.

Recommendations for Further Research

A number of findings which may be important in the identification of those people who will succeed but which were not expected will now be considered. These findings are not grounded in previous research and need to be identified in more research in order to be of importance.

One of the most interesting findings deals with the intercorrelations of the Minnesota Multiphasic Personality Inventory subscales. The intercorrelations between the subscales for those students who succeed are much greater in both number and magnitude than for those who do not succeed. This finding has two critical implications, the first being that those people who do not succeed tend to show much less consistency

in their profiles. For those students who have completed their degree, the intercorrelations among the subscales of the Minnesota Multiphasic Personality Inventory are significant and positive among almost every subscale. This implies that those students completing a degree tend to have profiles which have scores that are similar across subscales. Perhaps it would be possible to develop this information into a way of identifying those people who would succeed by looking not at where their scores lie but rather what the profile looks like in terms of how consistent the scores are across the subscales. This type of consideration has not been made in any previous research, but it is something which might serve as a consideration for future research.

Another unexpected result which appeared from the data was that Graduate Record Examinations did not show significant relationships with graduate grade point average but rather with undergraduate grade point average. This finding was only true of the successful group and not of the unsuccessful group. If the Graduate Record Examination is to be used to give an indication of those students who are to succeed then there should be a relationship between graduate grade point average and the Graduate Record Examination. Other studies have obtained significant relationships between the Graduate Record Examination and the graduate grade point average; perhaps it is a problem with this study either in the sample size, the presentation of the data, or the manner in which graduate grades are assigned. But it is worth considering what this relationship is telling about the ability these tests have in identifying those who perform in graduate school. It is also possible, though, that graduate grade point average is not a good criterion measure to use and that perhaps the test is useful but the graduate grade point average does not

give the information needed. This second statement could be backed up by the fact that the mean graduate grade point average when compared between the successful group and the unsuccessful group with a t-test does not give a value which is significant. But when looking at the mean for undergraduate grade point average, it can be seen that here there is a significant difference between the successful and the unsuccessful groups. These results seem to indicate that for the population under consideration, undergraduate grade point average was an overall better indicator for those who would succeed in graduate work than the graduate grade point average obtained from the first few semesters' work as a graduate student. One reason for the graduate grade point average not distinguishing between the two groups is that graduate grade point average has such a very small range that the difference between the successful and the unsuccessful group could not be detected.

This study should serve as a description of some basic relationships which exist across groups and measures. The significant relationships which have been found should lead to further study of the particular measures involved. It would be of particular interest to deal with the findings mentioned above. This research has been limited by the number of different admissions policies which have been in effect over the years; the changing of admissions requirements has kept individuals from having similar test scores across time. Further research might then center on obtaining data which is consistent across time; this would then allow for a larger sample size and perhaps more accurate information allowing for the development of a prediction theory.

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APPENDIX

THE VALIDITY AND CLINICAL SCALES OF THE MMPI

Scale	Interpretation
L - Lie Scale	This is the second validity scale. Persons trying to present themselves in a favorable light (e.g., good, wholesome, honest) obtain high L Scale elevations.
F - Scale	F is the third validity scale. High scores suggest carelessness, confusion, or "fake bad."
K - Correction Scale	An elevation on the last validity scale, K suggests a defensive test taking attitude. Exceedingly low scores may indicate a lack of ability to deny symptomatology.
1 - Hs - Hypochondriasis	High scorers have been described as cynical, defeatist, and crabbed.
2 - D - Depression	High scorers usually are shy, despondent, and distressed.
3 - Hy - Hysteria	High scorers tend to complain of multiple symptoms.
4 - Pd - Psychopathic Deviate	Adjectives used to describe some high scorers are adventurous, courageous, and generous.
5 - Mf - Masculinity-Femininity	Among males, high scorers have been described as aesthetic and sensitive. High-scoring women have been described as rebellious, unrealistic, and indecisive.
6 - Pa - Paranoia	High scorers on this scale were characterized as shrewd, guarded, and worrisome.

THE VALIDITY AND CLINICAL SCALES OF THE MMPI*
(Continued)

Scale	Interpretation
7 - Pt - Psychasthenia	Fearful, rigid, anxious and worrisome are some of the adjectives used to describe high Pt scorers.
8 - Sc - Schizophrenia	Adjectives such as withdrawn and unusual describe Sc high scorers.
9 - Ma - Hypomania	High scorers are called sociable, energetic, and impulsive.
0 - Si - Social Introversion	High scorers: modest, shy, and self-effacing. Low scorers: sociable, colorful, and ambitious.

*Kleinmunts (1967), p. 220.

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